



## **NASA Technology Development and Transfer Office** *John C. Stennis Space Center*

### ***Improved “Y” Pattern Control Valve Enhances Performance***



#### ***Split Bonnet “Y” Pattern Control Valve***

A Dual-Use Cooperative Agreement between the Propulsion Test Directorate (PTD) at Stennis Space Center (SSC) and Oceaneering Reflange, Inc. of Houston, TX has produced an improved “Y” pattern split-body control valve for use in the propulsion test facilities at Stennis Space Center. The split-body, or clamped bonnet technology, provides for a “cleaner” valve design featuring enhanced performance and increased flow capacity with extended life expectancy. Other points addressed by the partnership include size, weight and costs. Overall size and weight of each valve will be reduced by 50% compared to valves currently in use at SSC. An initial procurement of two 10” valves will result in an overall cost reduction of 15% or approximately \$50,000 per valve.

Stennis Space Center’s Propulsion Test Directorate maintains full-scale rocket engine and rocket engine component test facilities that can be used for experimental testing, as well as, certification of propulsion systems and related rocket components. The experimental rocket engine and component test facility, or E Complex, currently consists of three active test areas each unique in purpose and capability but common in the types of equipment used to service the specific test areas. In an attempt to

#### ***HOT* Points**

- **Repair cost reduced**
- **Valve is smaller in size and lighter in weight**
- **Lower production cost**
- **“Cleaner” valve design**

improve the efficiency of critical valves within the propellant delivery system, NASA partnered with Oceaneering Reflange to resolve issues regarding performance and reliability. "NASA worked hand-in-hand with Oceaneering Reflange to identify problems within the existing hardware, determine the most effective solutions and fabricate the designs necessary to produce an efficient valve," said Haynes Haselmaier, valve specialist at SSC. "The result was a high performance Y pattern split body control valve, which is smaller in size, lighter in weight and costs around one-third less to produce than previously installed valves."

Split-body design technology provides for a "cleaner" valve design featuring enhanced performance and increased flow capacity, as well as, extended life expectancy. Two features highlight the design. First, the split body design provides enhanced access to the valve body for the manufacturer, as well as, repair technicians. Second, this design incorporates a novel bushing design that prevents misalignment of the plug thereby reducing uneven wear and galling, seat leaks and debris generation.

The size and weight of each valve was the second point addressed by the development agreement. Previously installed valves were large, bulky and extremely heavy weighing 12,000 pounds or more. The new design reduced the weight of the valve to around 6,000 pounds and the overall size of the valve was decreased by 40 percent. These reductions will not only make the valves simpler to fabricate, repair and maintain, but will eliminate the need for specialized tools or repair fixtures.

Overall cost reduction was the final benefit of this partnership; life-cycle costs to NASA have been reduced. An initial purchase of two valves has provided NASA with a reduction in procurement cost of 15 percent. In addition, out-of-state repair costs are expected to be reduced by an additional 50 to 75 percent. These savings are a direct result of the incorporation of simpler and more robust wear part designs, improved manufacturing techniques, elimination of specialized tools and the ability to perform repairs without removing the valve body from the piping system.

#### **COMMERCIAL USAGE AND APPLICATION**

Oceaneering Reflange has and continues to commit its internal Research and Development funds to the improvement of this design. The experience and expertise the company gained from the development and application of this technology gives Oceaneering Reflange a unique

competitive advantage in the commercial market place. In addition to the conventional application areas such as aerospace and petrochemicals, Oceaneering Reflange is attempting to introduce the valve into lesser-known areas- power generation and the special process or super critical processing industry.

#### **WHY DUAL-USE WAS IMPORTANT**

The Dual-Use concept of product development is based on the sharing of costs, risks and successes between the government and a commercial partner. On this project Stennis PTD contributed expertise, facilities, engineering resources and funding. Oceaneering Reflange, the commercial partner, contributed their unique expertise and facilities, as well as, manufacturing and marketing capabilities. In addition the Technology Development and Transfer Office (TDTO) at Stennis assisted in overall project formulation, contract execution and handled any intellectual property issues which arose.

"Dual-Use development partnerships are an excellent example of how NASA and industry can partner to develop a NASA needed technology while at the same time help fulfill a commercial market place need," said John Bailey, NASA TDTO Dual-Use Technology Development Manager.

"This agreement, and the subsequent working relationship we established with NASA has, allowed our company to address a government need in addition to enhancing our commercial product at the same time. As a result, Oceaneering Reflange is receiving increased interest from companies outside the traditional applications area," said Rod Sutton, technical sales manager at Oceaneering Reflange.

#### ***Points of Contact***

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